DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service
Agency for Toxic Substances
and Disease Registry

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Memorandum

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From Acting Director
Office of Health Assessment

Subject SI-86-135B, Review of Air Sampling Data
Lee's Lane Landfill, Kentucky

To Mr. Casimer V. Pietrosewicz
Public Health Advisor
EPA Region IV

EXECUTIVE SUMMARY

The Agency for Toxic Substances and Disease Registry (ATSDR) was requested to assist in the development of an air sampling strategy to assess the extent of inhalation exposure from gaseous contaminants emitted from the Lee's Lane Landfill to local residents, and to review the resulting data for its measure of public health significance.

We conclude that the levels measured do not constitute a health hazard to the public residing adjacent to the landfill, in terms of noncarcinogenic effects. The acceptable lifetime cancer risk level for benzene and methylene chloride is in the remedial action alternative decision range proposed in the EPA Superfund Public Health Evaluation Manual, prompting the need for remedial action beyond the no action alternative.

A detailed statistical examination of the data will be forthcoming when it is complete.

BACKGROUND

Lee's Lane Landfill has been the subject of several investigative endeavors and public health comments on the part of the Environmental Protection Agency (EPA) and ATSDR. (1-5)

The initiation of the final remedial action alternative has been delayed due to the concern of residents of adjacent housing areas that the issue of inhalation exposure to toxic chemicals emanating from the landfill had not been addressed. Data was gathered in five separate time periods as reflected in reports dated October 10 and 15, 1985, February 26, 1986,

March 27, 1986, and July 23, 1986. (6) In memoranda dated December 12, 1985, and March 14, 1986, ATSDR provided detailed guidance to EPA in the conduct of this investigation. The data collected during these sampling efforts, with the exception of the October 15 data, are the subject of this memorandum.

DATA ANALYSIS

A multitude of chemical compounds was detected in the investigation. However, many were detected sporadically, or were of minor concern from a public health standpoint. These substances were excluded from subsequent analysis, and five were retained. Benzene, toluene, ethylbenzene, methylene chloride, and 1,1,1-trichloroethane were used in the analysis. Background samples were averaged according to specific substance and the average subtracted from the raw data. The analytical method employed (7) used the sample-by-sample addition of a surrogate compound to measure the recovery of the data, that is, to account for sample loss during analysis. The surrogate recovery limits for the method are not well described in the reference. Discussions with EPA officials responsible for the analysis of the data indicated that a useable recovery range for the data was 50-200 percent. While we would have preferred a narrower range, the use of a narrower range resulted in too many data points lost to analysis. Therefore, this range was used.

There are two questions which are the focus of this investigation. The first question is directly related to public health: "Do the data indicate that persons residing within the area of study are excessively exposed to airborne contaminants, and is the source of these contaminants the Lee's Lane Landfill?" The second question is, "Do the landfill emissions cause inhalation exposure in excess of that caused by other conditions in the surrounding environment, namely, the presence of chemical plants (Borden Chemical Company, Louisville Gas and Electric Cane Run Plant, American Synthetic Rubber Company)?"

This memorandum deals with the first question. The second question requires a detailed statistical examination of the data. This evaluation of the data will be provided at a later date when the analysis is complete.

EPA has a list of minimum effective doses (MED) by inhalation for selected substances, depending upon the type of health effect under consideration, either carcinogenic or noncarcinogenic. (7) The following table compares the calculated individual resident intakes for the compounds of interest to the MED, and a calculated lifetime intake and compares it to the chronic allowable intake (AIC) for determination of degree of risk for noncarcinogenic effects. In these comparisons, we have assumed that an adult's and child's daily air intake is 20 and 5 cubic meters, respectively, a lifetime is 70 years, and the average (all indoor plus outdoor) concentration of a substance represents chronic exposure.

Substance	MED (mg/day)	Mean Exposure (mg/m^3)	Adult Dose (mg/day)	Child Dose (mg/day)	AIC (mg/kg/day)	Hazard Ratio (Dose*/AIC) child-adult
Benzene	1.7	0.004	0.076	0.019	none given	
Toluene	2690	0.025	0.504	0.126	none given	
MeCl	21800	0.017	0.331	0.083	none given	
1,1,1-TCE	13.2	0.223	4.456	1.114	6.3	0.012-0.010
Ethylbenz.	724	0.005	0.101	0.025	none given	

*on a per kilogram basis

Inspection of the above reveals that the estimated daily dose of the five substances of interest do not exceed the compound-specific minimum effective dose for producing noncarcinogenic health effects. In the case of 1,1,1-trichloroethane, where an allowable daily intake (chronic) figure is available, the hazard ratio in both the adult and child case is much less than unity, indicating that, considering only the estimated inhalation exposure route, one would not expect 1,1,1-trichloroethane-related noncarcinogenic health effects to develop over a lifetime of exposure at this level.

The following addresses the carcinogenic health effects potential of benzene and methylene chloride. The potency factor (PF) is a value representing the upper 95 percent confidence limits on the slope of the dose-response curve for the specific substance, and is used to estimate potential carcinogenic risk.

Substance	Potency Factor $(mg/kg/day)^{-1}$	Chronic Daily Intake (mg/kg/day)	Risk ($\times 10^{-6}$)
Benzene	0.026	0.001	28
Methylene Chloride	0.00063	0.005	3
		Total	31

Assessments of lifetime cancer risk in the range of 10^{-6} represent a level in which decisions should be made on actions to reduce the risk. According to the EPA Public Health Evaluation Manual, remedies considered should reduce ambient chemical concentrations to levels associated with a carcinogenic risk range of 10^{-4} to 10^{-7}, where possible. These data indicate that a risk in excess of 10^{-6} may be present for both benzene and methylene chloride, and the cumulative cancer risk is 31 times this decision criteria. Therefore, some corrective action beyond the no action alternative may be warranted.

SUMMARY AND CONCLUSIONS

Comparisons to minimum effective doses for causation of noncarcinogenic health effects shows that these limits are not exceeded. However, comparisons to a lifetime cancer risk of one in one million indicates that this level of risk is exceeded for methylene chloride and benzene.

The data do not indicate that the health of the public in the vicinity of Lee's Lane Landfill will be adversely affected by the concentrations measured, in terms of noncarcinogenic effects. Because the lifetime cancer risk equation, which estimates the potential for development of cancer, falls in the acceptability of risk decision range, we believe that a remedial action beyond the no action alternative is justified.

RECOMMENDATIONS

1. The gas venting system presently in place should have a maintenance schedule to insure that proper working order is maintained.
2. Periodic monitoring of the vent system and the residential area adjacent to the landfill for benzene and methylene chloride should be performed to evaluate the efficiency of the venting system.

3. Methane monitors or some other type of methane measurements are suggested for the houses where methane has been shown to be a problem.

REFERENCES

1. Remedial Investigation and Feasibility Study of Alternatives, Volumes I and II, Lee's Lane Landfill Site, Jefferson County, Kentucky. NUS Corporation, June 1985.
2. Review of Remedial Investigation/Feasibility Study for Lee's Lane Landfill NPL Site, Louisville, Kentucky. ATSDR, November 15, 1985.
3. Final Endangerment Assessment Document. May 1985.
4. Review of Final Endangerment Assessment Document. ATSDR, June 19, 1986 (SI-86-135).
5. SI-86-062A, Lee's Lane Landfill, Louisville, Kentucky. (Design of the air sampling protocol.) ATSDR, December 12, 1985.
6. Air Sampling Reports, Lee's Lane Landfill, Louisville, Kentucky. EPA, October 10, 1985, October 15, 1985, February 26, 1986, March 27, 1986, and July 23, 1986.
7. Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air. EPA, April 1984. EPA-600/4-84-041.

I hope this information is useful to you.

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